U.S. Environmental Protection Agency Region 2

Request for NMFS' concurrence on a determination that the approval of the
Proposed Limetree Bay Terminal, St. Croix, Air Permit
May effect but is Not Likely to Adversely Affect (NLAA) ESA-listed species under NMFS' jurisdiction

August 11, 2020

Introduction:

This document is being prepared to address ecological impacts on the Federally listed Endangered Species in the St. Croix, U.S. Virgin Islands. This was prepared for all listed species in general, including the leatherback turtle, the Nassau Grouper, and the endangered corals near Sandy Point Wildlife Refuge which NMFS specifically identified as requiring the type of analysis provided in this document. The analysis was primarily done by assessing the effects on acid deposition from the Limetree Bay refinery and focusing on areas most likely to find these species and their nesting habitats. In addition, EPA included other considerations in reaching our conclusions, as discussed below.

To do so, Region 2 applied EPA's state of the science air quality model, CMAQ, to assess acid deposition on both the terrestrial and aquatic surfaces. CMAQ is the best available model to make this assessment because it is EPA's state of the science model and is widely accepted for calculating acid deposition throughout the United States. The results show that the total deposition is less than values of concern found in various literature. The literature includes documents used in regulatory forums used for assessing the effects of acid deposition including deposition on terrestrial and aquatic species. The documents include the Risk and Exposure Assessment for the Review of the Secondary NAAQS of NO2 and SO2 (September 2009) used by EPA in setting the secondary National Ambient Air Quality Standards (NAAQS), EPA's Guideline on Air Quality Models at 40 CFR Part 51, Appendix W, the Federal Land Managers Air Quality Related Values (FLAG) phase I report (2010), Federal Land Managers Interagency Guidance for Nitrogen and Sulfur Deposition Analyses (November 2011), a Biological Evaluation (BE) prepared by Region 2's Water Division in response to the USVI's Water Quality Standards Criteria, a Biological Opinion prepared by the National Marine Fisheries Service in response to the BE, and other literature provided by the National Marine Fisheries Services. These documents are referenced herein and some key excerpts from the documents are included below for the reader's convenience.

Region 2 also used data from the National Acid Precipitation Assessment Program (NAPAP) that operates an acid deposition monitor in the Virgin Islands National Park. Critical loads were identified from the literature above, some State air agencies, and values used in Canada and Europe. These values range from about 2.7 kilograms/hectare/year to about 20 kg/ha/yr. In this case, model results show that Limetree is expected to add less than 1 kg/ha/yr. Nevertheless, safeguards and trends are discussed including compliance with existing Water Quality Criteria Standards adopted by the USVI.

These findings lead EPA Region 2 to conclude that issuing the PAL permit to Limetree Bay Refinery and Terminal results in a determination of "may affect but is not likely to adversely affect (NLAA)" the endangered species and critical habitat on and in the surrounding areas of the island of St. Croix with particular attention to the western most part of St. Croix where the species primarily live and nest.

A. **Description of the proposed action**.

1) What is a Plantwide Applicability Limit?

A plantwide applicability limit (PAL) is an annual emission limit, in tons per year, for a specific pollutant emitted from all the emissions units at a facility. The PAL for a specific pollutant is established by adding a de minimis level established in EPA regulations at 40 CFR §52.21(b(23), known as the "significant level" to the baseline actual emissions of that pollutant, defined at 40 CFR §52.21(b)(48), emitted by all emission units within a facility. A PAL permit is not a new construction permit. It is issued to an existing facility that has a valid permit to emit the prescribed air pollutants. The PAL permit would allow Limetree the flexibility to make changes within its facility while limiting emissions increases to levels that do not trigger the Clean Air Act's Prevention of Significant Deterioration (PSD) permit requirements at 40 CFR §52.21, as long as the facility complies with the PAL limits established in the PAL permit. A PAL permit does not supersede any other federal or state regulations. If finalized, the PAL annual emission limits and the associated monitoring, record-keeping and reporting requirements will be incorporated into a title V permit by the Virgin Islands Department of Planning and Natural Resources (VIDPNR).

EPA issued a draft Plant Wide Applicability Limit (PAL) air permit to Limetree Bay Refinery on September 20, 2019.

Summary of the PAL Permit

Limetree seeks to establish PALs for Voltile Organic Compounds (VOC), Nitrogen Oxides (NOx), Carbon Monoxide (CO), Particulate Matter (PM2.5, PM10 and PM) and Sulfur Dioxide (SO2). Pursuant to the procedures in 40 CFR §52.21 (aa)(6), Limetree's plantwide applicability limits were based on the sum of the actual emissions, by pollutant, for each emissions unit at the plant during a baseline period plus the applicable significant level (as defined at 40 CFR §52.21(b)(23)) for each pollutant. The actual emissions of the baseline period for each pollutant were averaged over a 2-year period in 2009 and 2010.

In this case, the annual PAL limits are as follows: 6,094 TPY VOC; 5,231 TPY NOx; 3,248 TPY CO; 399 TPY PM2.5; 412 TPY PM10; 466 TPY PM; 1,482 TPY SO2.

The PAL permit contains federally enforceable emission monitoring and reporting requirements. Continuous emission monitoring, continuous parametric monitoring, engineering calculations using emission factors, or engineering calculations using mass balance are imposed on Limetree to continuously measure the emissions of the PAL pollutants to ensure compliance with the PAL limits. Limetree must submit semi-annual monitoring reports and prompt deviation reports to EPA for review. EPA and VIDPNR inspectors also have authority to conduct periodic inspections to further assure compliance with those limits. In addition, in this case EPA is requiring ambient air monitoring for 3 of the most stringent air quality pollutants to ensure that the resulting air quality impacts are within acceptable public health and welfare standards, i.e., the National Ambient Air Quality Standards (NAAQS).

It should be noted that Limetree could start operating at any time without the PAL permit. In fact, Limetree is not required to obtain a PAL permit. Rather, Limetree requested a PAL to afford them operational flexibility without triggering PSD preconstruction permitting requirements. The annual limits taken by Limetree in the PAL permit are much lower than the allowable emissions in the existing PSD permit.

PAL Monitoring, Testing, Recordkeeping and Reporting

This PAL permit includes monitoring, testing, recordkeeping, and reporting requirements for each PAL pollutant to ensure compliance with the plantwide applicability limits.

Limetree must show, for each PAL pollutant, that the sum of the monthly emissions from all emissions units for the previous 12 consecutive months is less than the PAL. In order to demonstrate compliance, Limetree is required to employ a rigorous emissions monitoring system established by EPA in the PAL permit conditions that, at a minimum, uses one of the four general monitoring approaches listed at 40 CFR §52.21(aa)(12)(ii):

1) Continuous Emissions Monitoring Systems (CEMS);

2) Continuous Parametric Monitoring Systems (CPMS) or Predictive Emissions Monitoring Systems (PEMS);

3) Emission factors; or

4) Mass balance calculations for activities using coatings or solvents.

The PAL regulations at 40 CFR §52.21(aa)(12)(iii) through (ix) provide further detail on the minimum requirements for each of these four methods of the PAL emissions monitoring system. Consistent with this provision, the PAL permit sets specific emissions monitoring requirements for each unit at the facility. In addition, testing is required within 6 months of issuance of the PAL to validate emission factors used for significant emissions units, and re-validation of all emission factors is required once every 5 years.

Additional PAL provisions include the requirement that the owner or operator maintain all records necessary to determine compliance with the PAL for 5 years from the date of the record, including a copy of the PAL application and each annual title V compliance certification. The owner or operator must also submit semi-annual emissions monitoring reports that include a list, for review by EPA, of all emissions units modified or added during the preceding reporting period with specific monitoring methods, deviation reports and corrective actions, and any results of a re-validation test or method within three months of completion.

PAL Permit Lifetime, Reopening, Renewal, and Expiration

If finalized, the PAL permit will be valid for a 10-year period, beginning on the effective date of the permit. Any re-opening of the PAL permit during the 10-year period must be done in accordance with 40 C.F.R. 52.21(aa)(8).

If Limetree seeks to renew the PAL, it must submit an application in accordance with 40 CFR §52.21(aa)(10)(iii). The application must be submitted at least six months prior to, but not earlier than 18 months from, the date of permit expiration, and the proposed renewal permit would be subject to public participation requirements. If the permit is not renewed in accordance with the procedures in 40 C.F.R. 52.21(aa)(10), the PAL permit expires.

2) The anticipated magnitude of difference between baseline emissions and peak emissions under the “operational flexibility” feature of the permit

As discussed above, the PAL levels are determined based on establishing the baseline emissions for each PAL pollutant and then adding to the baseline a pollutant-specific “significant” level (or de minimis) that is codified in the PSD regulation. The baseline is determined based on an actual, annual average emissions of any two years in the 10 years prior to submitting a complete PAL application. Limetree is using a baseline from the years 2009 to 2010. The baseline is very close to the PAL levels identified in response to question 1 because the significant level is small relative to the emissions at the facility. For example, the significant level for CO is 100 TPY; and the baseline emissions are 3,148 TPY; therefore, the PAL limit for CO is 3,248 TPY. The other significant levels are even smaller, as follows: 40 TPY for NOx; 40 TPY of VOCs and; 40 TPY for NOx as ozone precursors; 15 TPY of PM10; 25 TPY of PM; 10 TPY of direct PM2.5 emissions. Therefore, the peak emissions will only be a small percentage over the baseline for each pollutant.

<u>Potential to Emit (PTE) vs PAL</u>

Pollutant	**Total** **Current PTE: tons/year based on Existing PSD Permit**	**PAL** **Plantwide Applicability Limit** **tons/year; 12-month rolling total basis** **(value in parenthesis is the de minis emission increase over the 2009-2010 actual emissions. It is included in the total value presented)**	**Reduction from** **PTE** **% Lower**
NOx	20,904	5,594 (40tpy)	73%
PM2.5	1,558	412 (10tpy)	74%
PM10	1,724	399 (15tpy)	77%
SO2	15,309	1,482 (40tpy)	89%

3) The identity and estimated concentrations or load of other pollutants (e.g., PAH, metals, organics, mercury) in the plume that may reach and partition into the water.

PAH, metals, organics, and mercury are emitted as part of the exhaust gas during combustion of residual fuel (No. 6 fuel oil). However, Limetree has informed EPA that it burns only refinery gas, diesel or propane/butane, and not the residual fuel. As such, PAH, metals, organics and mercury are not emitted as particulate matters as a result of the combustion of these fuels. Therefore, we do not believe PAH, metals, organics, and mercury is relevant to an assessment of the PAL permit.

4) Estimated in-water concentrations or load of permitted and associated pollutants

SO2 and NO2 emissions convert to acids, in particular, sulfates and nitrates. EPA applied the CMAQ photochemical grid model that included concentrations on surface water. (see section B).

In addition, we have modeled impacts of NO2, SO2, and PM2.5 where the modeling domain extend to overwater locations as seen in Figures 1-4. Our analysis focused on these three pollutants because these are the strictest criteria pollutants and they were not previously addressed for those averaging times. The figures include the expected maximum impact locations and the spatial distribution. As seen, the maximum impacts are close to the facility and taper out with distance from the facility. The modeling domain includes Sandy Point and other coastal areas beyond the shoreline that are not close to the facility. While we believe that there is uncertainty in the magnitude of the impact, we have better confidence in the spatial distribution. The uncertainty will be improved upon receiving better data from both the ambient monitored data and the stack emissions which have record keeping requirements in the PAL permit and will allow EPA to adjust the PAL if needed. However, the uncertainty does not bear on our conclusions about the effects of the PAL on the species because deposition is based on a total amount of pollutant emitted in a year rather than a short term average.

5) The design of the monitoring program (e.g., continuous, during planned pulses, systematic, random, a combination) –

Both the emission monitoring and the proposed ambient air monitoring will be continuous.

6) Any weather or time-related restrictions on emissions (e.g., wind direction, rain, nighttime versus daytime, coral spawning periods) –

Most of the PAL permit conditions require monitoring of emissions from the units at the facility. The PAL permit contains no weather or time-related relaxation of restrictions on the PAL limits or the monitoring provisions. In fact, even if the emissions monitoring equipment is not functioning, Limetree must assume the worst case emissions in calculating compliance with the PAL limits.

7) Due to the "operational flexibility" feature of this permit, estimates of a central tendency alone (i.e. averages, geometric means) would not allow for a credible exposure analysis. For this reason, any emissions point estimates provided by EPA need to be identified as baseline or peak and must include confidence intervals. Alternatives to point estimates include quantiles or cumulative distribution functions.

Record keeping of emissions are a permit requirement that will help inform future modeling of the impacts with more certainty including impacts overwater.

The baseline emissions in this case are based on actual operating scenarios of the facility in 2009 to 2010 when the facility was operating (with the de minimis emission level added). The regulations allow for this flexibility provided the annual cap (PAL) is met. However, we agree that the impacts due to the short term variability of those emission are uncertain. This is the reason EPA is requiring the ambient monitoring of short term impact at several locations so that the annual variability of those impacts could be captured and assessed. The ambient monitors which will be placed in the modeled short term peak locations will provide data that provides information on the central tendencies and confident intervals of the real time impacts. The result of the data will allow EPA to evaluate the short term trends and re-open and adjust the emission levels, if necessary, in the future. This will be done in coordination with all the applicable Federal Land Mangers including NMFS so that all Federal requirements are addressed. The uncertainty in the short-term variability does not affect our conclusions regarding the deposition effects on the ecosystem.

B. **An adequate description of the action area.** The action area is all areas affected directly or indirectly by the action.

Ambient Air Quality Dispersion Modeling

As part of Limetree's Environmental Justice (EJ) analysis, which was required by EPA to ensure that public health and the environment are protected in areas of concern, Limetree performed a dispersion modeling analysis to assess the **effects of the facility** on the National Ambient Air Quality Standards (NAAQS). The figures (Figures 1 – 4) include the **expected maximum impact locations and the spatial distribution** for 1-hr NO_2, 1-hr SO_2, 24-hr PM2.5, and annual PM2.5). The **maximum impacts** (indicated by red star) occur primarily to the **north and west closer in to the facility and diminish with distance from the facility**. While we believe that there is uncertainty in the magnitude of the impact due to assumptions in short-term emission calculations, we have better confidence in the spatial distribution.

As also seen in the windrose generated using five years of site-specific meteorological data (Figure 5), the direction of the wind is predominantly from the northeast and we do not anticipate the plume from the stacks to impact Sandy Point National Wildlife Refuge.

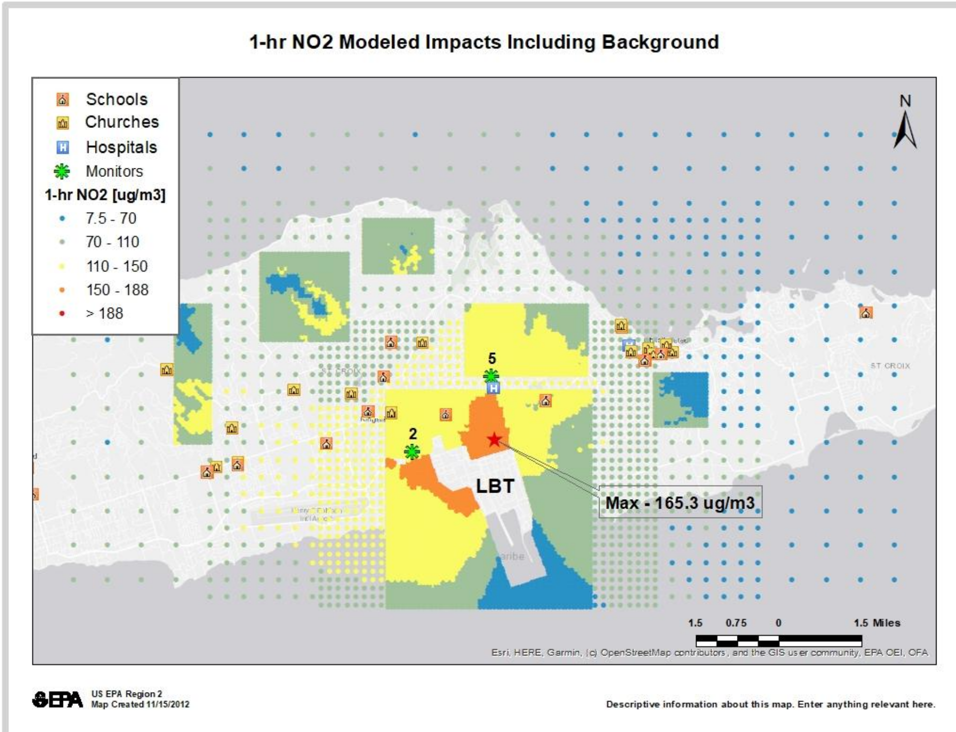

Figure 1: 1-hour NO2 modeled impacts

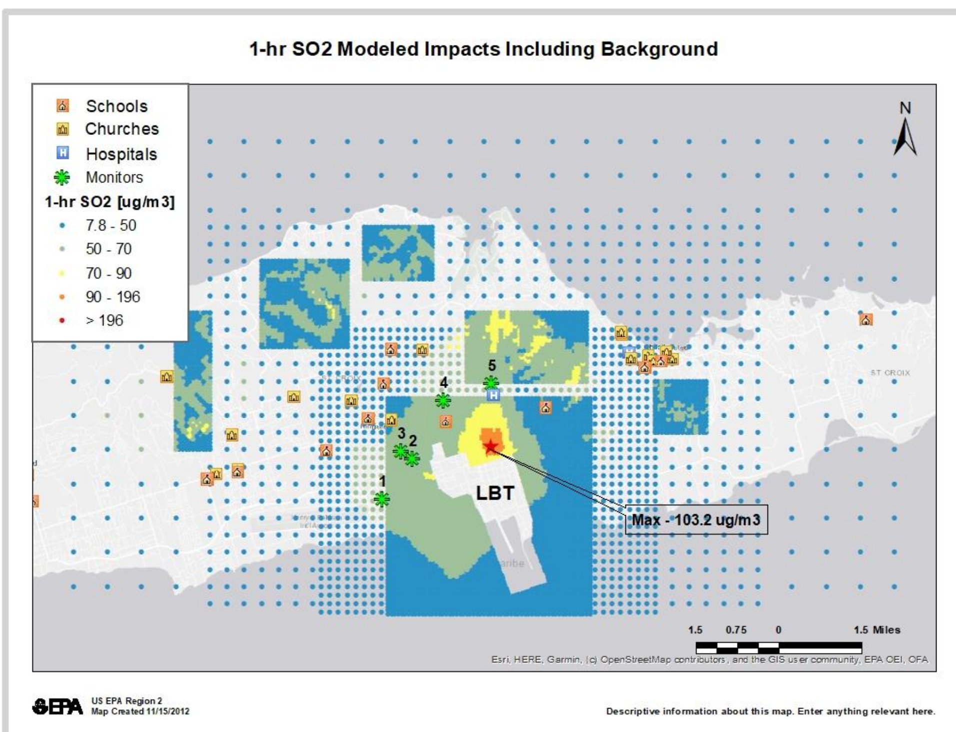

Figure 2: 1-hour SO2 modeled impacts

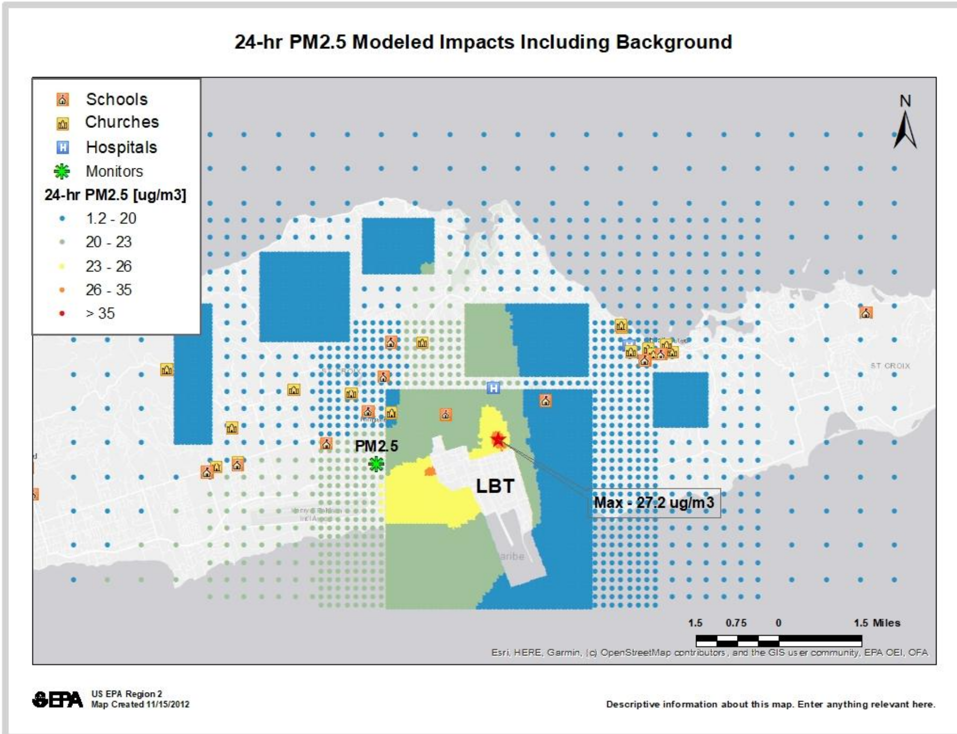

Figure 3: 24-hour average PM2.5 modeled impacts

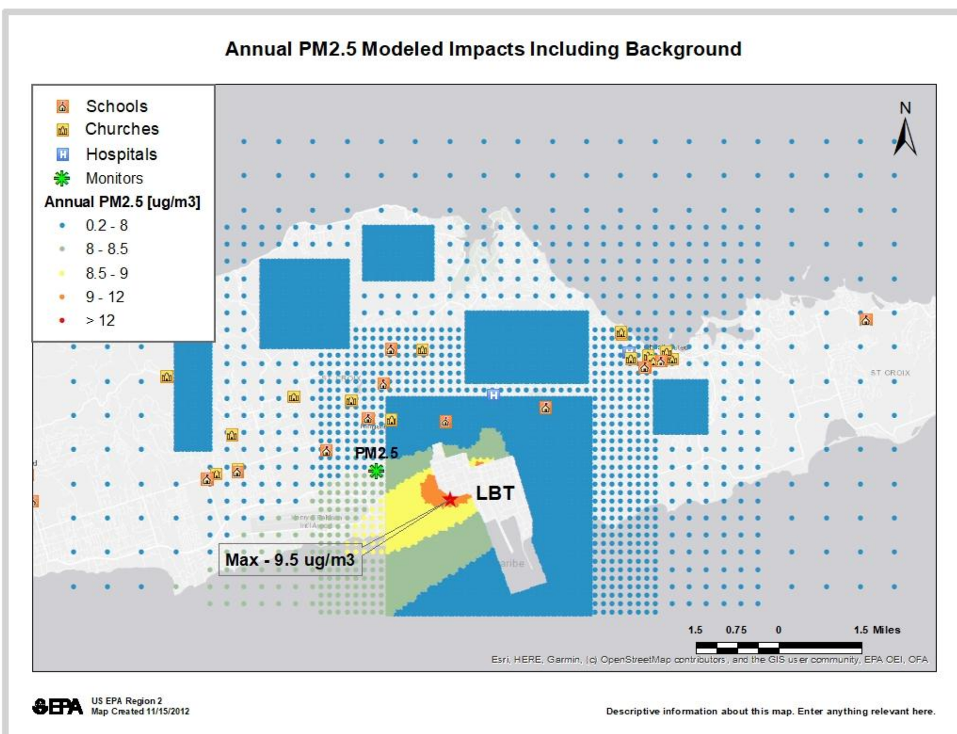

Figure 4: Annual average PM2.5 modeled impacts

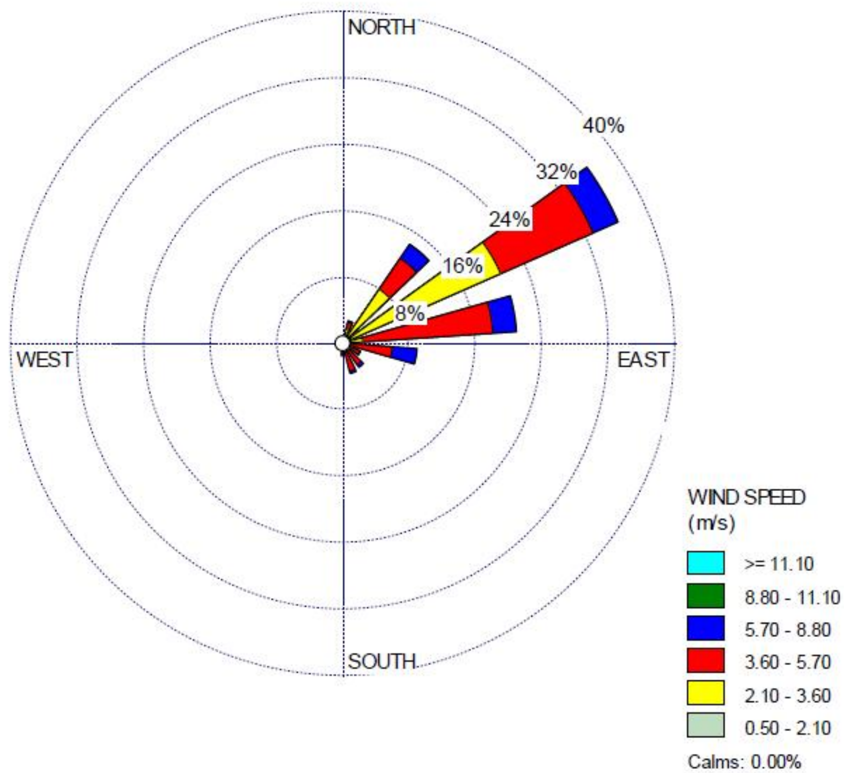

Figure 5: Wind Rose for 2005-2009

Deposition Modeling

EPA used EPA's **Community Multiscale Air Quality (CMAQ) model, that can simulate both wet and dry deposition and chemical transformation of NOx, SOx and PM to ascertain the possible impacts on the endangered species**.

CMAQ is used to determine deposition of nitrogen, sulfur, and particulate matter (PM2.5 + PM10). CMAQ is a state-of-the-art, 3-dimensional grid-based Eulerian air quality model designed to simulate the formation and fate of gaseous and PM species, including ozone, oxidant precursors, and primary and secondary PM concentrations and **deposition over urban, regional, and larger spatial scales**. CMAQ requires two primary types of inputs: meteorological information and emission rates from sources of emissions that affect air quality. Note that EPA's NLAA is accurate regardless of uncertainties in the short-term emissions, and resulting variability in hourly impacts, because CMAQ modeling for deposition purposes relies on annual data. The PAL permit includes annual emission limits and no short-term limits. This annual data was used for the deposition analysis; unlike for the dispersion modeling, where the annual emissions were converted to short-term based on several approximations.

The photochemical model simulations are performed using CMAQ v.5.3. They are discussed in detail in the Technical Support Document for EPA's Updated 2028 Regional Haze Modeling for Hawaii, Virgin Islands, and Alaska. The modeling domain incorporates Puerto Rico and Virgin Islands as shown in Figure 6. It contains 35 vertical layers with a top at about 17,550 meters, or 50 millibars (mb). The model runs produce hourly air quality concentrations for each cell across the modeling domain. A 2016-based air quality modeling platform which includes emissions, meteorology, and other inputs for 2016 as the base year for the modeling was initially run. The 2016 base year emissions were projected to a future year base case scenario, 2028, and the model was rerun with the 2028 emissions. The results herein are from the 2028 runs. Besides SO_2, emissions of all pollutants are higher in the 2028 scenario. SO_2 emissions have reduced because of changes in fuel requirements for commercial marine vessels.

Meteorology: Meteorological inputs for the photochemical and emissions models were generated with version 3.9.1.1 of the Weather Research and Forecasting (WRF) model. The model run used grid cell sized at 9km horizontal resolution. WRF output was processed for input to CMAQ using the Meteorology-Chemistry Interface Processor (MCIP) version 4.5 (Otte and Pleim, 2010).

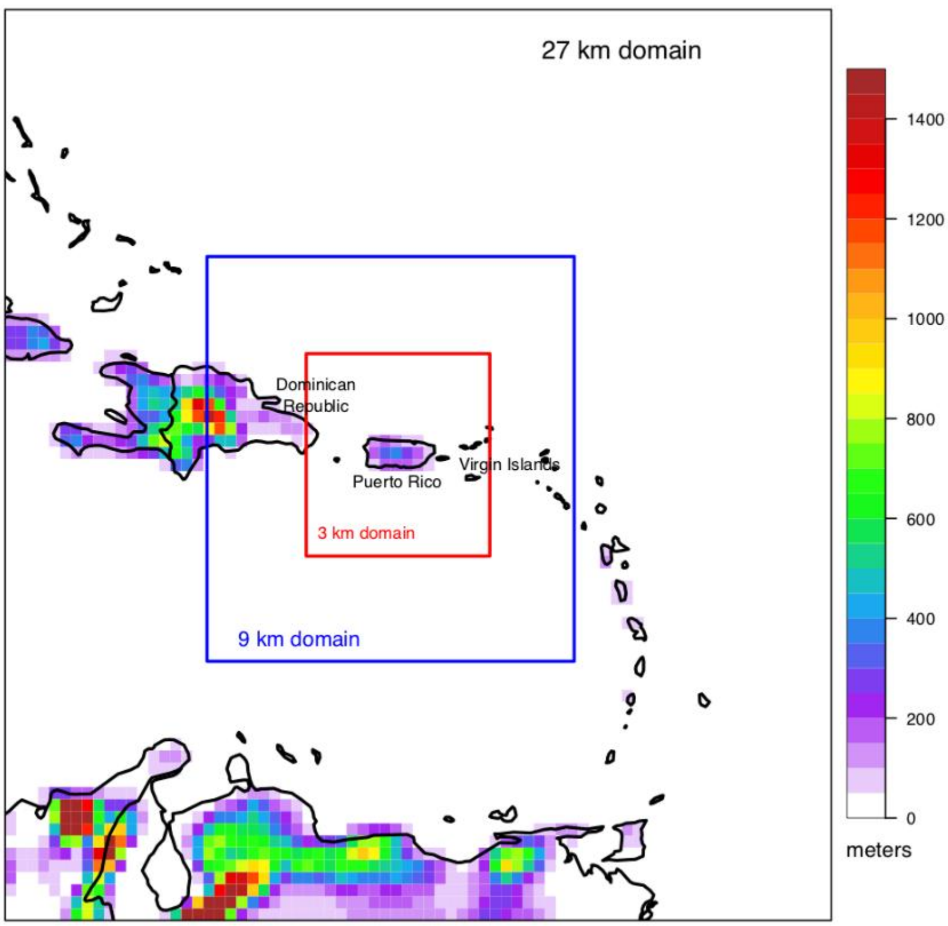

Figure 6: Map of WRF and CMAQ modeling domain for Puerto Rico and Virgin Islands. The 9 km grid outlined in blue is used for the deposition modeling.

Emissions: CMAQ requires detailed emissions inventories (anthropogenic and biogenic) containing temporally allocated (i.e., hourly) emissions for each grid-cell in the modeling domain for a large number of chemical species that act as primary pollutants and precursors to secondary pollutants. Annual emission inventories for 2016 and 2028 were preprocessed into CMAQ-ready inputs using the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system (https://www.cmascenter.org/smoke/).

Biogenic emissions of volatile organic compounds (VOC) and nitrogen oxide (NO) were generated using the Model of Emissions for Gases in Nature (MEGAN) version 2.0 (Guenther et al., 2006) at 0.5 degree scale and allocated to the finer scales using relevant MODIS landcover categories. Day-specific wildland fire emissions were based on Fire Inventory for NCAR (FINN) (Wiedinmyer et al., 2011). Sea-salt (Gantt et al., 2015) and halogen (Sarwar et al., 2015) emissions from the ocean were included. Lightning, wind-blown dust, and volcanic emissions were not included. Electric generating unit (EGU) emissions were based on state submitted data to the 2016 emissions modeling platform. The primary data source for non-EGU point sources is the 2016 point source National Emissions Inventory (NEI). Industrial emissions were grown to 2028 according to factors derived from the 2019 Annual Energy Outlook. The onroad mobile source emissions were generated using the released version of the Motor Vehicle Emissions Simulator (MOVES2014b). Onroad and nonroad mobile source emissions were created for 2028 using emission factors based on MOVES2014b run for 2028, combined with activity data projected from 2016 to 2028 based on data from the Annual Energy Outlook (AEO) 2018 and state/local-provided data, where available. Commercial Marine Vessel (CMV) emissions for ships with Category 1 and Category 2 (i.e., small to medium-sized) engines, as well as ships with Category 3 (i.e., large) engines, were modeled as point sources. Residential wood combustion (RWC) emissions were projected from the 2014NEIv2 values to represent 2016 and 2028 based on EPA's 2011v6.3 emissions modeling platform and implemented into spreadsheet tools by MARAMA. Point oil and gas emissions were based on the 2016 point source emissions modeling platform.

Limetree emissions: The facility provided EPA with annual emissions for each emission unit at the facility, including stack parameters, as part of their PAL application. These source specific emissions for Limetree were added to the base CMAQ run. The results of this run (base + Limetree) were then subtracted from the base CMAQ run to isolate the facility impacts.

Deposition: CMAQ deposition to water is the flux from the atmosphere to the water surface. CMAQ deposition algorithms estimate the total amount of an air pollutant species that goes into the water. It takes into account dry and wet deposition. Each of the species of concern here (sulfur, nitrogen, and PM) are a sum of various related species that the model outputs. Nitrogen deposition includes nitrogen oxide, nitrogen dioxide, nitric acid, nitrate aerosol, peroxy acetyl nitrate, organic nitrates, nitrate from isoprene, dinitrogen pentoxide, nitrous acid, and peroxynitric acid. Sulfur deposition includes sulfur dioxide and sulfate aerosol. PM deposition includes nitric acid and the following aerosol species: nitrate, ammonium, sulfate, elemental carbon, and organic carbon. PM includes PM2.5 and PM10.

Figures 7, 8, and 9 show the modeled annual sum of sulfur, nitrogen, and PM deposition, respectively, for the Limetree facility. Deposition values in kg/ha for the grid cells around the facility are also shown in these maps. These maps demonstrate, as discussed below in Section C, that the values are all below the critical load benchmarks. These maps do not show the entire domain and have been zoomed into the vicinity of Limetree.

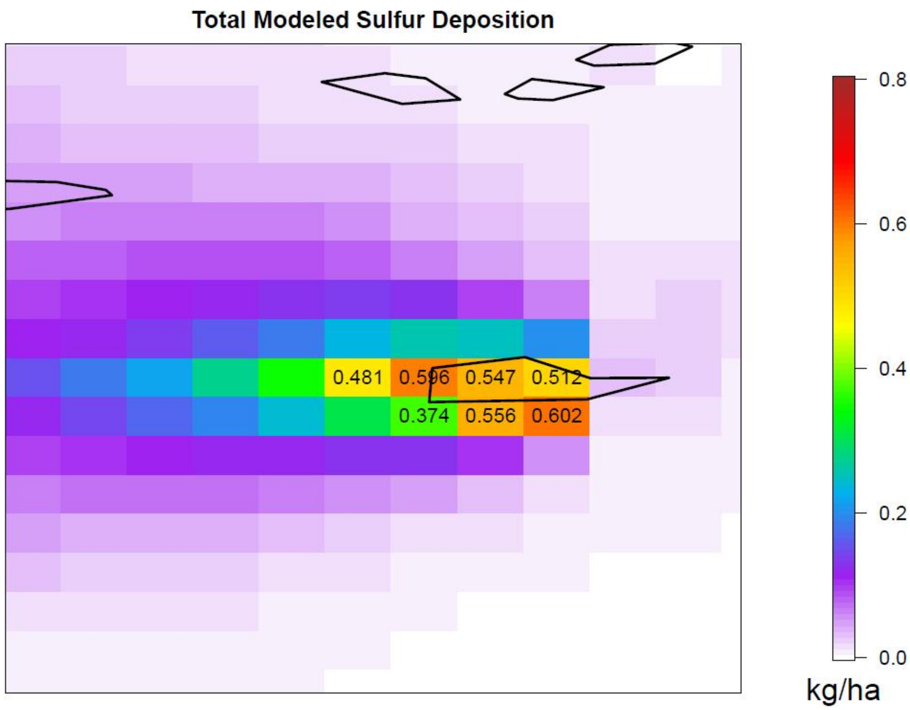

Figure 7: Total annual modeled sulfur deposition for Limetree Bay Terminal. The maximum values of ~0.6 kg/ha occur to the west and south of the facility.

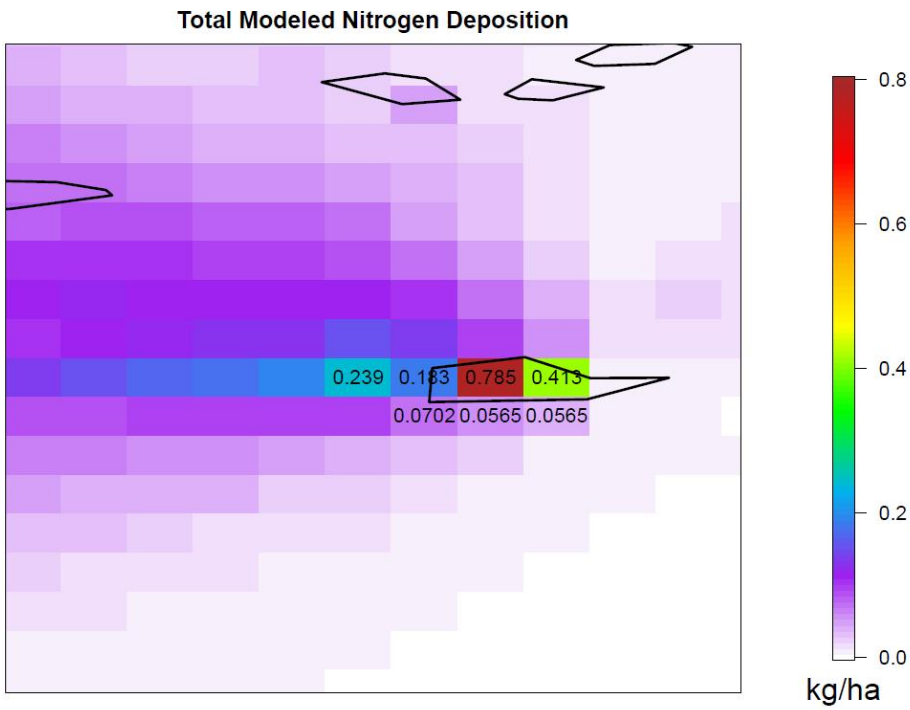

Figure 8: Total annual modeled nitrogen deposition for Limetree Bay Terminal. The maximum values of ~0.8 kg/ha occurs on the island. The maximum value in the surrounding waters is ~0.24 kg/ha/.

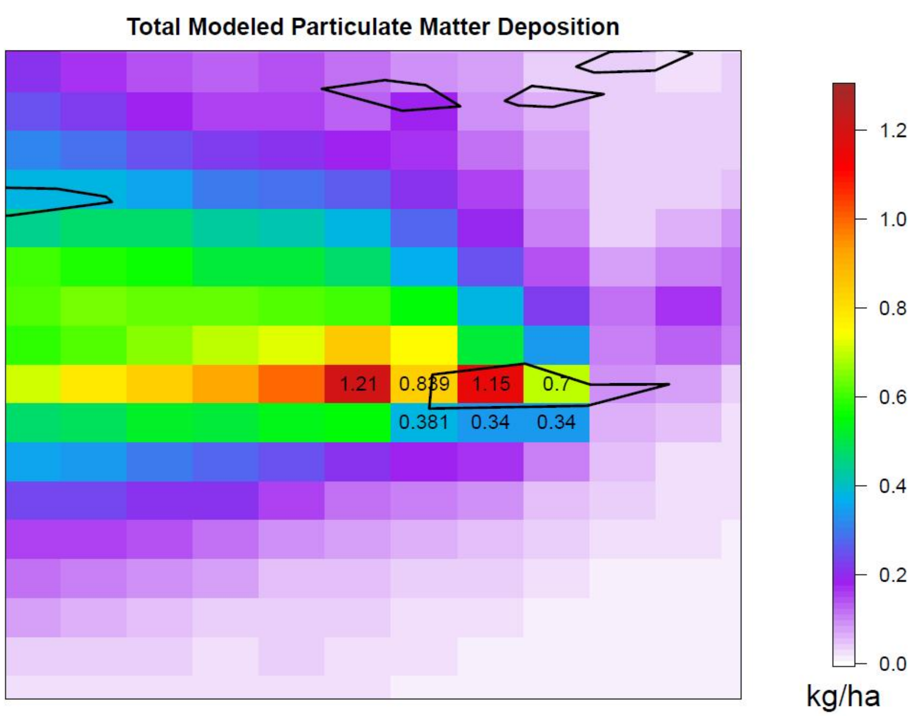

Figure 9: Total annual modeled particulate matter (PM) deposition for Limetree Bay Terminal. The maximum values of ~1.2 kg/ha occur to the west of the facility.

C. **Identify and address effects resulting from or as a "reasonably-certain-to-occur consequence" of the proposed action.**

As stated earlier, the consequence of issuing the PAL will not result in new emissions since the PAL is not a construction permit or permit to operate and the facility is currently allowed to operate under the existing PSD permit. However, given the 8-year time lapse since the facility operated and that there are endangered species in the area, EPA is assessing the possible effects on the species from the air emissions from Limetree. Region 2 did this by assessing the impacts on both the terrestrial and aquatic areas where they are expected to nest and live, including their critical habitat. As discussed in greater detail in section B above, the CMAQ model was used to calculate acid deposition impacts both on land and overwater.

Further, as seen in Figures 1-4 in section B above, NAAQS modeling provided more localized spatial distribution of the most stringent standard for each of the three criteria pollutants examined. These impacts were determined by EPA's air dispersion model, AERMOD in the PAL permit process. The modeled impacts were also provided to the US Fish and Wildlife Service (FWS) which concurred on February 28, 2020 with Region 2's may affect, but not likely to adversely affect determination (see attached correspondence letter) for the following species in the area: (West Indian manatee (*Trichechus manatus*), hawksbill sea turtle (*Eretmochelys imbricata*), leatherback sea turtle (*Dermochelys coriacea*), and St. Croix ground lizard (*Ameiva polops*). The concurrence by the FWS was made in part with the acknowledgement that a re-initiation of consultation could take place in the future if applicable.

Since NMFS is also interested in acidification effects, EPA used a state of the science model, CMAQ, that can simulate both wet and dry deposition and chemical transformation of NOx, SOx and PM to ascertain the possible impacts on the endangered species. Critical loads were used as benchmarks in the deposition assessment. Benchmarks for defining a critical load is a recognized data gap partly because it varies with each complex ecosystem. EPA's Guideline on Air Quality Models defines a critical load as, **''a quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge.** (Nilsson and Grennfelt 1988)" (40 CFR Part 51, Appendix W). To assess a critical load in this case, Region 2 reviewed regulatory literature including information from EPA's National Critical Load Database, reports used by EPA to set secondary NAAQS which considers acid deposition, guidance documents developed jointly by various Federal Land Managers to assess impacts of acid deposition on their regimes that are used in collaboration with EPA on Clean Air Act permits, and levels adopted by some State's Acid Deposition Control Acts (e.g., New York and Minnesota). The critical loads found in these documents show that the acid deposition levels calculated in this case are within levels found to be within acceptable ranges by regulatory agencies. The critical loads largely depend on the buffering capacity of the particular ecosystem. For aquatic systems, the critical loads found were developed primarily for lake and streams. Given that the Caribbean Sea is a far vaster environment with a depth that is greater than a euphotic zone of a lake or stream, Region 2 believes these benchmarks provide conservative estimates (https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table). Further, the FLAG report also notes that saltwater is less sensitive to sulfur deposition (FLAG 2010 Guidance, Table 11).

The protection from acid deposition will be further ensured with the recently adopted USVI's Water Quality Criteria Standards, that includes pH. Region 2 Water Division's review of these standards included a biological evaluation where a "not likely to adversely affect" determination on the endangered species was made. The Water Division's determination, which includes the water body in the vicinity of Limetree, was concurred by the NMFS with the provision that the criteria could be revisited if an issue later arises.

In summary, the critical load benchmarks include the following:

The State of New York established a value of **20 kg/ha/yr** for wet sulfate deposition. State of Minnesota established value **11 kg/ha/yr** wet sulfate deposition. In Canada, researchers have estimated the critical loads of S in wet deposition necessary to protect moderately sensitive lakes in eastern provinces is **6.7 kg/of S** in wet deposition. With additional data on lake and stream chemistry available for sensitive systems in Nova Scotia, Ontario, and Quebec, the Canadians are now recommending a more stringent critical load, equivalent to **2.7 kg/ha/yr** of wet deposition S. The maximum value of Limetree's modeled sulfur deposition is ~0.6 kg/ha (see Fig. 7, above), which is lower than each of these benchmarks.

Studies summarized in the Risk and Exposure Assessment for Review of the Secondary NAAQS, below, use ranges where **5 ka/ha/yr** of nitrogen are not likely to have negative effects. Studies cited the FLAG 2010 guidance state that in northern Europe (NITREX), Wright (1995) recommended a N critical load of less than **10 kg $ha^{-1}yr^{-1}$** to protect European forests and fresh waters from N saturation. The maximum value of Limetree's modeled nitrogen deposition is ~0.8 kg/ha on the island and ~0.24 kg/ha/ in the surrounding waters, which are both below these benchmarks.

Particulate matter deposition is comprised of multi-pollutants. The multi-media linkages are incorporated in air quality models like CMAQ as shown in Figure 10. In this case, Limetree's maximum modeled particulate matter deposition which is comprised of the multi-pollutants is 1.2 kg/ha which is less than the critical loads referenced in this document.

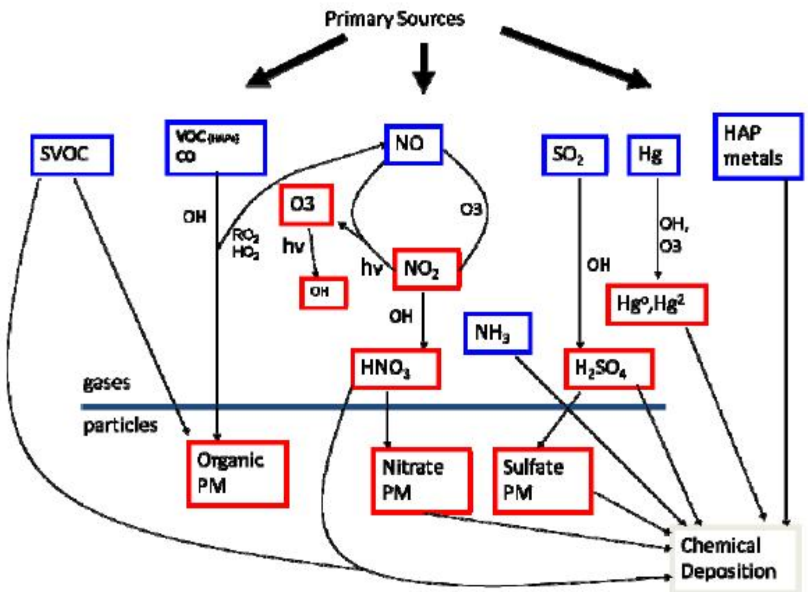

Figure 10: Diagram illustrating the multiple pollutant, multiple media linkages that are incorporated in air quality models like CMAQ.

Given that Limetree's acid deposition impacts are lower than the critical loads above, the criteria pollutant impacts are lower than the secondary NAAQS, discussed below, that are set with acid deposition in mind (last done for the higher potential emissions from HOVENSA, previous owner of the refinery now owned by Limetree), the reduction in the potential emissions from the PSD permit to the PAL permit, the status of the measured values at the USVI deposition monitors under the National Atmospheric Deposition Program which are defined as fair, the safeguards adopted by the USVI's Water Quality Criteria Standards, and the anticipated reduction in sulfur emissions due to stricter marine fuel standards, Region 2 believes that the acid deposition impacts to the endangered species as a result of emissions from the Limetree PAL permit may affect, but are not likely to adversely affect the species.

Further, based on the biological opinion for the Single Point Mooring project, "a biological monitoring program will be implemented to monitor the effects of project construction and operation on the adjacent aquatic ecosystem. A description of this program is in the submitted plan from November 2018 titled "Minimization and Compensatory Mitigation Plan For Impacts To ESA Listed Species, Essential Fish Habitat and Critical Habitat" and includes water quality monitoring for pH, turbidity, total suspended solids, dissolved oxygen, salinity, and temperature; monitoring of photo quadrats established to encompass nearby corals, including ESA-listed corals, which could be impacted by project impacted water quality; marine resource monitoring for sediment cover, benthic community, fish, and sea turtles. Monitoring will occur during all in-water work or work which has the potential of affecting water quality.
Limetree will create an Endangered Species Management Plan to address the numerous ESA-listed species that occur in the Action Area, including listed corals, fish, marine mammals, sea turtles and birds. The plan will be provided to NMFS for review prior to the start of operations. The applicant will work with NMFS, FWS and DPNR during the drafting of this plan."

Supporting findings are below:

Risk and Exposure Assessment for Review of the Secondary National Ambient Air Quality Standards for Oxides of Nitrogen and Oxides of Sulfur (EPA-452/R-09-008a September 2009):
(https://www3.epa.gov/ttn/naaqs/standards/no2so2sec/data/NOxSOxREASep2009MainContent.pdf)

Secondary NAAQS: Below are excerpts from the *Risk and Exposure Assessment for the Review of the Secondary NAAQS of NO2 and SO2* (September 2009), that provide information for Region 2's review. The area surrounding the refinery, including Sandy Point and the coastal areas of St. Croix, met the secondary NAAQS for NO2 and SO2, which include consideration of acid deposition, when it was modeled in the 2007 for the HOVENSA facility using even higher potential emission rates than the PAL permit emission limits. The secondary NAAQS are defined as 100 ug/m3 of NO2 on an annual average basis, and 1300 ug/m3 of SO2 on a 3 hour average basis. HOVENSA's modeled impacts of these pollutants using their potential emission rates were 96 ug/m3 for NO2 and 1271 ug/m3 for SO2. For clarity, NAAQS are based on concentrations expressed in ug/m3 or ppb whereas deposition is expressed in kg/hectare.
A link to the primary and secondary NAAQS for all criteria pollutants may be found at: https://www.epa.gov/criteria-air-pollutants/naaqs-table.

Although EPA considers acid deposition when setting the secondary NAAQS, a more detailed acid deposition analysis, discussed section B above, was undertaken in this case for the Limetree's PAL emissions to further assess the impacts on the species.

The secondary NAAQS was set by EPA to protect public welfare. Welfare is defined as "[t]he effects on soils, **water**, crops, vegetation, manmade materials, **animals**, **wildlife**, weather, visibility, and climate, damage to and deterioration of property, and hazards to transportation, as well as effects on economic values and on personal comfort and well-being, whether caused by transformation, conversion, or combination with other air pollutants." [Clean Air Act Section 302(h)]. CAA Section 108 and 109 call for the periodic review of these NAAQS.

Deposition of nitrogen- and sulfur-containing compounds that are derived from NOx and SOx may be wet (e.g., rain, snow), cloud and fog deposition, or dry (e.g., gases and particles) and can affect ecosystem biogeochemistry, structure, and function.

Wet deposition includes rain, snow, fog, cloud water, and dew. In most areas, rain and snow are the primary contributors to wet deposition. However, in some high elevation areas, fog, cloud water, and dew are significant contributors. Dry deposition includes gases, aerosols and particles that undergo gravitational settling.

The primary components of Nitrogen and Sulfur deposition are ammonia (NH3), nitric oxide (NO), nitrogen dioxide (NO2), nitric acid (HNO3), and sulfur dioxide (SO2), while the primary particles are nitrate (NO3-), ammonium (NH4+), and sulfate (SO42-) ions as seen in Figure 11.

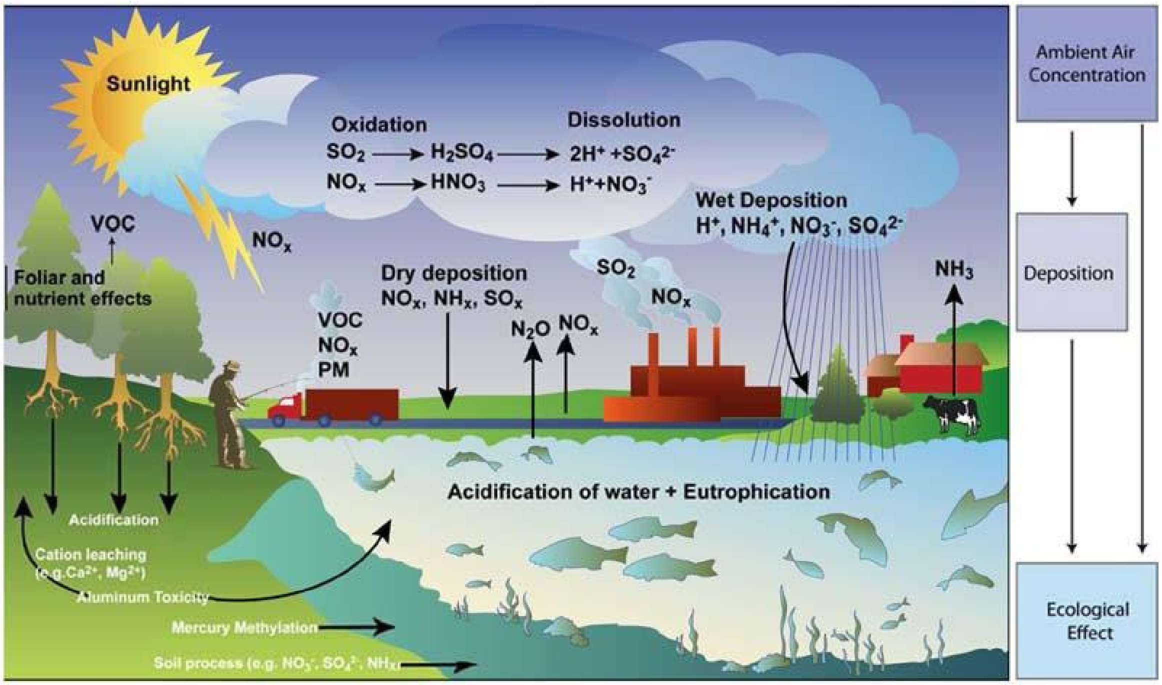

Figure 11: Nitrogen and sulfur cycling and interactions in the environment.

Because ecosystems differ in biota, climate, geochemistry, and hydrology, response to pollutant exposures can vary greatly between ecosystems. Knowledge about the relationships linking ambient concentrations and ecosystem services can be used to inform a policy judgment on a known or anticipated adverse public welfare effect such as the one under consideration in this document. The conceptual model outlined for aquatic acidification is in **Figure 12.**

In 1980, Congress created the National Acid Precipitation Assessment Program (NAPAP). The Amendments to the CAA passed by Congress and signed into law by the president on November 15, 1990, included numerous separate provisions related to the acidifying deposition problem that reflect the comprehensive approach envisioned by Congress.

The primary and most important of the provisions, Title IV of the CAA Amendments, established the Acid Rain Program to reduce SO2 emissions by 10 million tons and NOx emissions by 2 million tons from 1980 emission levels to achieve reductions over broad geographic regions. In this provision, Congress included a statement of findings that led them to take action, concluding that (1) the presence of acid compounds and their precursors in the atmosphere and in deposition from the atmosphere represents a threat to natural resources, ecosystems, materials, visibility, and public health; (2) the problem of acidifying deposition is of national and international significance; and (3) current and future generations of Americans will be adversely affected by delaying measures to remedy the problem.

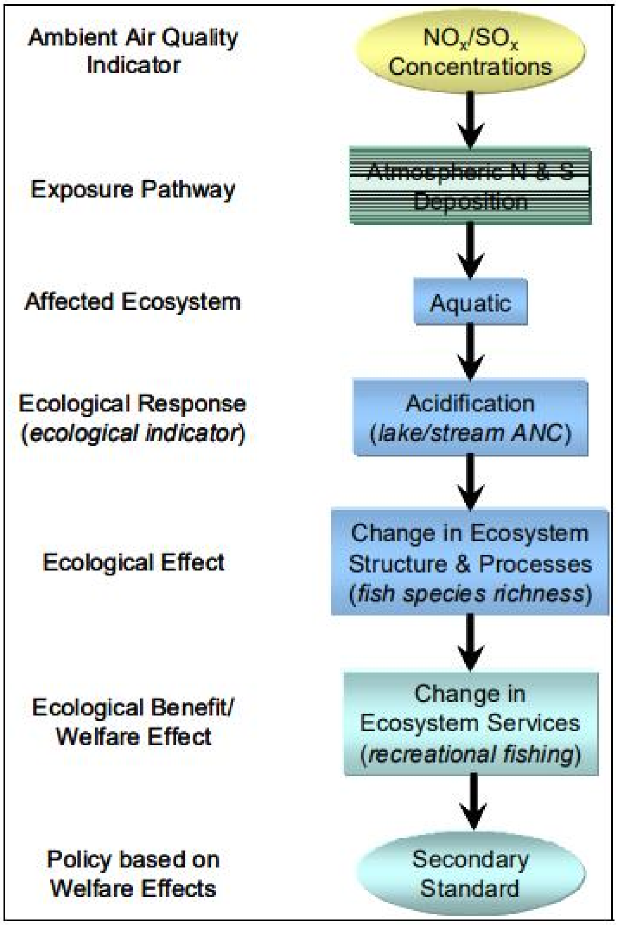

Figure 12: Conceptual model showing the relationships among ambient air quality indicators and exposure pathways and the resulting impacts on ecosystems, ecological responses, effects, and benefits to characterize known or anticipated adverse effects to public welfare.

Congress authorized the continuation of the NAPAP to assure that the research and monitoring efforts already undertaken would continue to be coordinated and would provide the basis for an impartial assessment of the effectiveness of the Title IV program. Information from the NAPAP was used in Limetree's acid deposition assessment as well (a link to the National Atmospheric Deposition Program is found at: http://nadp.slh.wisc.edu/NADP/)

Some findings noted in the Risk and Exposure Assessment Review found that "Sulfur and nitrogen deposition have been linked to changes in biogeochemistry related to aquatic ecosystems. Deposition of SOx, NOx, and NHx leads to ecosystems' exposure to acidification due to the reactions in the atmosphere that form various acidifying compounds. Acidifying deposition can lower the pH and acid neutralizing capacity (ANC) of aquatic systems. As ANC values decline below 100 μeq/L, an increase in the direct effects are exhibited on individual aquatic species, including fitness loss or death, reduced species richness, and altered community structure." See Figure 13 on Nitrogen Deposition levels below.

Metrics used to assess acid deposition include ANC and pH. These metrics measure the buffering ability of an aquatic system which affects the species within it. Information on ANC largely exists for lakes and streams rather than oceans or seas. The USVI's Water Quality Standards include pH which will be monitored by the USVI and used as a metric for acidification.

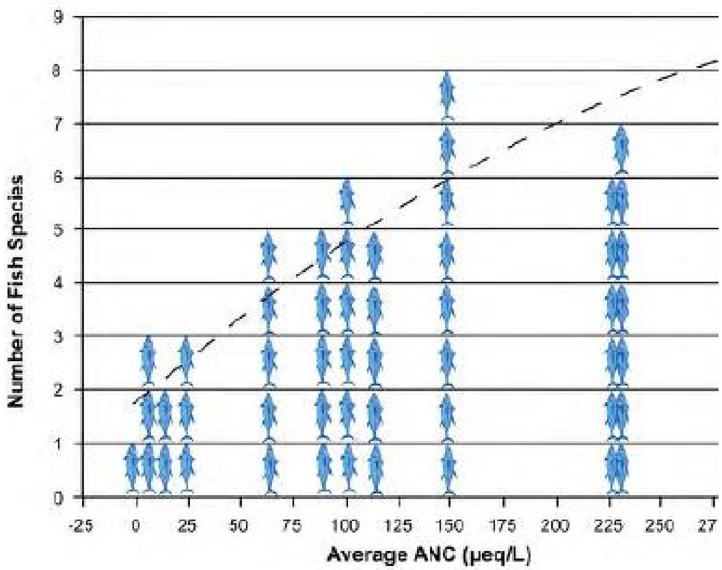

Figure 13: Number of fish species among 13 streams in Shenandoah National Park. Values of acid neutralizing capacity are means based on quarterly measurements from 1987 to 1994.

The findings in the Risk and Exposure Review also examine critical loads. While critical loads vary across ecosystems, the graph (Figure 14) below sums up possible ranges of critical loads. This range of ecological benchmarks may be used to develop a "green line/red line" schematic, similar to the forest screening model discussed in Lovett and Tear (2007) that illustrates the levels at which ecosystem effects may occur or are known to occur. The green area/line denotes that point at which there do not appear to be any effects, and the red line denotes the point at which known negative effects occur.

Again, the studies above were primarily done in lakes and streams but include some coastal areas. Given the volume of the ocean and the Caribbean Sea the buffering effects are expected to be greater. However, in this study, we are using the same metrics as a conservative estimate for decision making. In the case of Limetree, the impacts due to the PAL emissions fall within the "low probably to negative effects" since the maximum values are ~0.8 kg/ha on the island and ~0.24 kg/ha/ in the surrounding water.

EPA maintains a National Critical Loads Database. This database is a compilation of empirical and calculated critical loads data and information from many regional and national scale projects. The focus is on critical loads of sulfur and nitrogen deposition and the effects on terrestrial and aquatic environments. A report is included in the download file with details on calculations and references for all critical loads. The loads are primarily for the CONUS but provide comparison for Limetree's impacts which are below the applicable benchmarks. http://nadp.slh.wisc.edu/committees/clad/db/

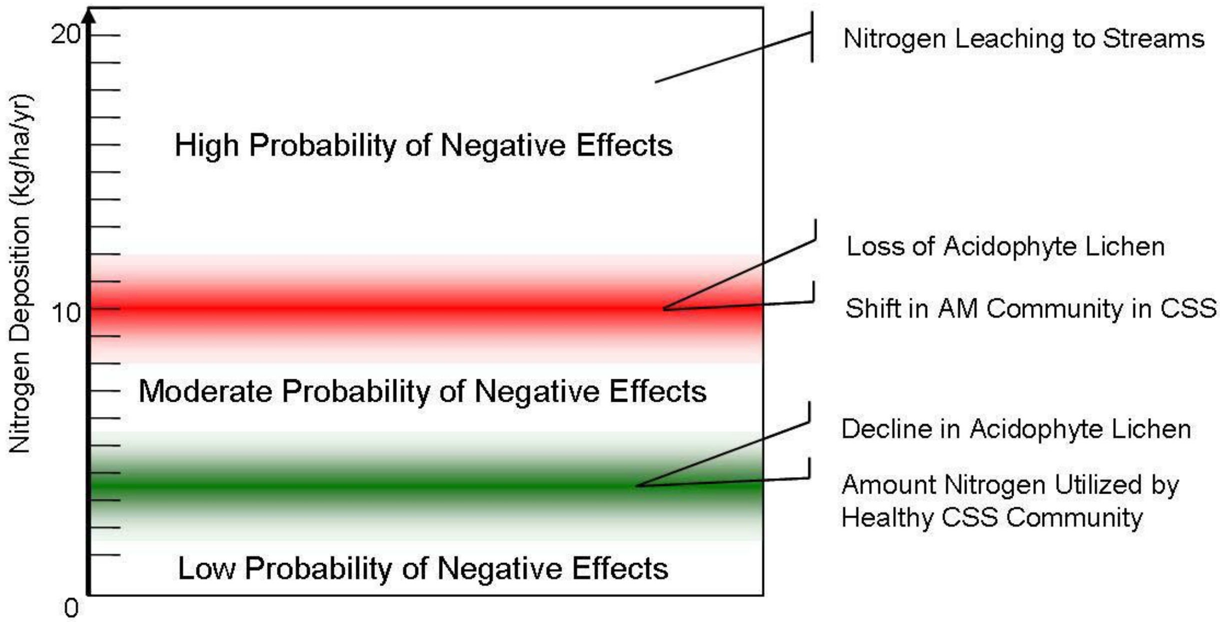

Figure 14: The red/green line figure illustrates a range of terrestrial ecosystem effects that may leach into streams observed relative to atmospheric nitrogen deposition.

Additional Supporting Guidance Documents:

Federal Land Managers Air Quality Values Group (FLAG) Report (2010):

EPA’s Guideline on Air Quality Models (2017) directs modelers to collaborate with the Federal Land Managers (FLM) responsible for a particular jurisdiction when impacts involve Air Quality Related Values (AQRV) of interest to these agencies including Acid Neutralizing Capacity (ANC) of their aquatic or terrestrial ecosystems due acid deposition. EPA reviewed FLM technical guidance for purposes of informing this ESA assessment. This included the Federal Land Managers Interagency Guidance FLAG Report 2010 and the Federal Land Managers Interagency Guidance for Nitrogen and Sulfur Deposition Analyses (November 2011): http://npshistory.com/publications/air-quality/flag-2010.pdf: https://irma.nps.gov/DataStore/DownloadFile/440123

The 1990 Clean Air Act Amendments give FLMs an ‘‘affirmative responsibility’’ to protect the natural and cultural resources including Class II areas (such as Limetree Bay’s location). The FLM agency’s responsibilities include the review of air quality permit applications from proposed new or modified major pollution sources and take into account the particular resources and Air Quality Related Value (AQRVs) that would be affected including Acid Neutralizing Capacity of its aquatic systems due to acid deposition. To develop greater consistency in the application of air quality models to assess potential AQRV impacts the FLM agencies have developed the Federal Land Managers’ Air Quality Related Values Work Group Phase I Report (FLAG). The agencies involved in FLAG include the U.S. Fish and Wildlife, the National Park Service, and the U.S. Forest Service among others. FLAG focuses upon specific technical and policy issues associated with visibility impairment, **effects of pollutant deposition on soils and surface waters**, and ozone effects on vegetation. To address the relationship between acid deposition and ecosystem effects, the FLM agencies have developed estimates of critical loads.

Federal Land Managers Air Quality Group (FLAG)(2010) – Guidance:

In general, FLMs rely on data from CASTNet (http://www.epa.gov/castnet) and NADP (http://nadp.sws.uiuc.edu/) sites to obtain measured data on deposition in their regimes.

A NADP deposition monitor is located in USVI in St. John's National Park. It provided historical information on the status of the deposition of sulfates, nitrates and particulates in the VI. The air quality status is summarized as either Good, Fair, or Poor. At this time, the acid deposition is classified as Fair for each of the three pollutants (sulfates, nitrates, and particulate matter). https://www.nps.gov/subjects/air/park-conditions-trends.htm?tabName=summary&parkCode=VIIS&paramCode=Nitrogen%20Deposition&startYr=2008&endYr=2017&monitoringSite=VI01%20(NADP-NTN)&timePeriod=10-year

Determining Critical Loads in FLAG:

FLAG introduced the concept of critical loads as it relates to air resource management in Class I areas (Class I areas have the strictest air quality requirements). The Agencies have adopted the widely used definition of critical load, "the quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge" (Nilsson and Grennfelt 1988). FLAG notes that critical loads have been widely accepted in Europe and Canada as a basis for negotiating control strategies for transboundary air pollution (Posch et al. 1997). In Canada, "researchers have estimated the critical loads of S in wet deposition necessary to protect moderately sensitive lakes in eastern provinces. That value, equivalent to 6.7 kg $ha_{-1}yr_{-1}$ of S in wet deposition, was used by Canada to argue for the U.S. to implement the Clean Air Act Amendments of 1990, which call for the initial reduction of sulfur dioxide emissions in the eastern U.S. and later from all electric utilities nationwide. With additional data on lake and stream chemistry available for sensitive systems in Nova Scotia, Ontario, and Quebec, the Canadians are now recommending a more stringent critical load, equivalent to 2.7 kg $ha_{-1}yr_{-1}$ of wet deposition S. […] Based on a set of regional N addition experiments conducted at sites in northern Europe (NITREX), Wright (1995) recommended a N critical load of less than 10 kg $ha_{-1}yr_{-1}$ to protect European forests and fresh waters from N saturation."

State Acid Deposition Control Acts:

In the United States, some states have attempted to set deposition standards or critical loads to protect sensitive ecosystems. In 1982, the State of Minnesota passed the Acid Deposition Control Act to limit wet sulfate deposition to 11 kg $ha^{-1}yr^{-1}$, which is equivalent to 3.7 kg S $ha^{-1}yr^{-1}$. At this sulfate level, precipitation pH was likely to remain above 4.7, which would protect lakes with ANC less than 50 microequivalents per liter (μeq l^{-1})."
https://www.pca.state.mn.us/sites/default/files/aq1-11.pdf

In 1983 and 1986, New York State Department of Environmental Conservation adopted a State Acid Deposition Control Act (SADCA). The SADCA established an environmental threshold value of **20 kg/ha/yr** for wet sulfate deposition. https://www.dec.ny.gov/chemical/8418.html

Summary and Conclusion:

In summary, given the results of the CMAQ modeled acid deposition impacts from Limetree's PAL emissions are lower than the critical load thresholds used by regulatory agencies and the other findings summarized in this document such as comparison of impacts to the secondary NAAQS, the reduction of potential emissions from the PSD permit to the PAL permit, the status of the measurements at the USVI deposition monitor, and the additional safe guards such as the water quality criteria standards adopted by the USVI, the anticipated reduction in sulfur emissions due to the stricter marine fuel standards, and the biological monitoring programs provisions on the SPM project, EPA Region 2 has concluded that issuing the PAL permit to Limetree Bay Refinery and Terminal results in a determination of "may affect, but is not likely to adversely affect (NLAA)" the endangered species and critical habitat on and in the surrounding areas of the island of St. Croix with particular attention to the western most part of St. Croix where the species primarily live and nest.

D. **Identification of each ESA-listed species and/or designated critical habitat** that may be affected by the action, how these species and/or designated critical habitat may be affected by the action, along with a reference to the most recent listing/designation notice in the Federal Register and any applicable species recovery plans.

Species	ESA Status	Critical Habitat	Recovery Plan
Marine Mammals – Cetaceans			
Blue Whale (*Balaenoptera musculus)*	E – 35 FR 18319	-- --	07/1998 10/2018 - Draft
Fin Whale (*Balaenoptera physalus)*	E – 35 FR 18319	-- --	75 FR 47538 07/2010
Sei Whale (*Balaenoptera borealis*)	E – 35 FR 18319	-- --	12/2011
Sperm Whale (*Physeter macrocephalus*)	E – 35 FR 18319	-- --	75 FR 81584 12/2010
Marine Reptiles			
Green Turtle (*Chelonia mydas*) – North Atlantic DPS	T – 81 FR 20057	Designated, but does not occur in St. Croix	FR Not Available 10/1991 – U.S. Atlantic

Species	ESA Status	Critical Habitat	Recovery Plan
Green Turtle (*Chelonia mydas*) – South Atlantic DPS	T – 81 FR 20057	-- --	FR Not Available 10/1991 – U.S. Atlantic
Hawksbill Turtle (*Eretmochelys imbricata)*	E – 35 FR 8491	Designated, but does not occur in St. Croix	57 FR 38818 08/1992 – U.S. Caribbean, Atlantic, and Gulf of Mexico
Leatherback Turtle (*Dermochelys coriacea*)	E – 35 FR 8491	Designated, includes Sandy Point in St. Croix	10/1991 – U.S. Caribbean, Atlantic, and Gulf of Mexico
Loggerhead Turtle (*Caretta caretta*) – Northwest Atlantic Ocean DPS	T – 76 FR 58868	Designated, but does not occur in St. Croix	74 FR 2995 10/1991 – U.S. Caribbean, Atlantic, and Gulf of Mexico

Fishes			
Giant Manta Ray (*Manta birostris*)	T – 83 FR 2916	-- --	-- --
Nassau Grouper (*Epinephelus striatus*)	T – 81 FR 42268	-- --	8/2018- Outline
Oceanic Whitetip Shark (*Carcharhinus longimanus*)	T – 83 FR 4153	-- --	9/2018- Outline
Scalloped Hammerhead Shark (*Sphyrna lewini*) – Central and Southwest Atlantic DPS	T – 79 FR 38213	-- --	-- --
Marine Invertebrates			
Boulder Star Coral (*Orbicella franksi*)	T – 79 FR 53851	-- --	3/2015- Outline
Elkhorn Coral (*Acropora palmata*)	T – 79 FR 53851	73 FR 72210	80 FR 12146
Lobed Star Coral (*Orbicella annularis*)	T – 79 FR 53851	-- --	3/2015- Outline
Mountainous Star Coral (*Orbicella faveolata*)	T – 79 FR 53851	-- --	3/2015- Outline
Pillar Coral (*Dendrogyra cylindrus*)	T – 79 FR 53851	-- --	3/2015- Outline
Rough Cactus Coral *(Mycetophyllia ferox)*	T – 79 FR 53851	-- --	3/2015- Outline
Staghorn Coral (*Acropora cervicornis*)	T – 79 FR 53851	73 FR 72210	80 FR 12146

E. **A statement certifying that you have used the best scientific and commercial data available.** Identify sources of information considered, including information contributed by the services, affected parties, etc. (This should include NMFS' documentation on the species) ‘

EPA used the best scientific and commercial data available. Scientific articles and technical documents used in this analysis are referenced below.

F. **A conclusion specifying that you have made the determination that the action is not likely to adversely affect listed species and, if present, critical habitat and that you request our concurrence.** To make this conclusion, the agency transmittal must clearly identify effects of the action as one of the following:

A. Wholly beneficial: Any effects with an immediate positive benefit to the species or habitat without adverse effects of any kind.

B. Insignificant: Insignificant effects relate to the magnitude of the potential impact. Based on best professional judgment, a person would not be able to meaningfully measure, detect, or evaluate insignificant effects.

C. Discountable: Discountable effects are those extremely unlikely to occur. Based on best professional judgment, a person must be able to identify a plausible effect that would be an adverse effect to a listed species, and determine that the likelihood of this effect occurring is so low as to be discountable.

Blue Whale, Fin Whale, Sei Whale, Sperm Whale, Oceanic Whitetip Shark, Giant Manta Ray: These species are likely to not be affected by pollutants emitted under the proposed permit because they would be extremely unlikely to be exposed to the plume. Fin and sei whales are typically found in deep, offshore waters, primarily in temperate to polar latitudes, and less commonly in the tropics. Blue whales will forage in shallower waters, but typically occur in more northern latitudes and are infrequent in the Caribbean. Sperm whales are the most common ESA-listed cetacean in Caribbean waters, but typically inhabit water depths of 1968 feet (600 meters) or more and are uncommon at depths less than 984 feet (300 meters). Oceanic whitetip sharks also occur in Caribbean waters, but in the open ocean, well offshore. Giant manta rays are also a deep-water species, but will frequent nearshore cleaning stations. Giant manta rays are not expected to frequent the waters affected by the plume because there are no known cleaning stations in the area. From Figure 15 below, suitable depths where these deep-water species are expected to occur are five or more kilometers from the port. EPA expects that species that do not commonly occur in Caribbean waters: fin, sei and blue whales, or are associated with deep waters: sperm whales and oceanic whitetip sharks, are extremely unlikely to be exposed to the permitted emissions. Also, as seen in the modeled impact figures in Section B, the air and deposition impacts of the facility are close to the shore and hence unlikely to impact these species. **EPA has made a determination that the effects of permitted emissions are discountable and are determined to be Not Likely to Adversely Affect (NLAA) for these species**.

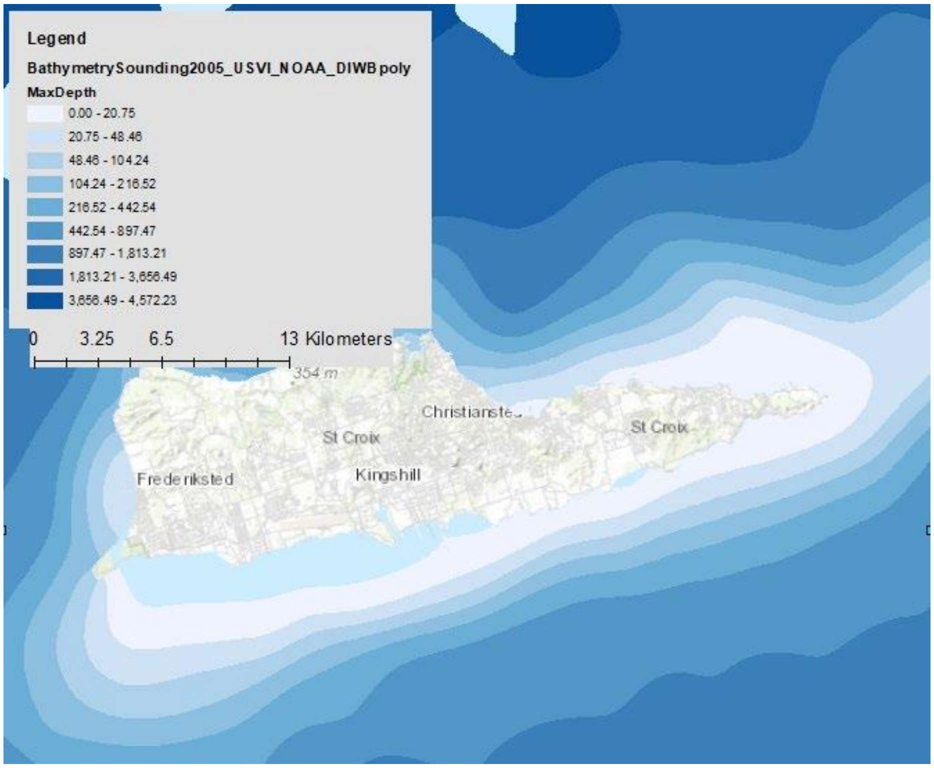

Figure 15: Bathymetry Soundings for US VI.

Scalloped Hammerhead Shark: Nursery habitat for this species does not occur within the area likely to be affected by emissions and associated particle deposition. Scalloped hammerhead are expected to transit past the facility, so any exposures would be short term. Also, the deposition impacts of the facility (from Section B) in the surrounding waters, where these species may occur, are below the thresholds discussed in Section C. **EPA has made the determination that any exposures would be insignificant and are determined to be NLAA for this species.**

Green Turtle, Hawksbill Turtle, Leatherback Turtle, Loggerhead Turtle: This species can occur near the shores. If they do occur, they are mobile and expected to transit past the facility and affected areas, so any exposures would be short term. Also, the deposition impacts of the facility (from Section B) in the surrounding waters, where these species may occur, are below the thresholds discussed in Section C. **EPA has made a determination that the effects of permitted emissions are discountable and are determined to be NLAA for these species**.

Nassau Grouper: This species can occur near the shores but has seen a dramatic decline in population due to overfishing (Garcia-Moliner & Sadovy, Kadison et al., NOAA Marine Protected Areas report). If they do occur, they are mobile and expected to transit past the facility and affected areas, so any exposures would be short term. Also, the deposition impacts of the facility (from Section B) in the surrounding waters, where these species may occur, are below the thresholds discussed in Section C. **EPA has made a determination that the effects of permitted emissions are discountable and are determined to be NLAA for this species**.

Boulder Star Coral, Elkhorn Coral, Lobed Star Coral, Mountainous Star Coral, Pillar Coral, Rough Cactus Coral, Staghorn Coral: This species can occur near the shores. The deposition impacts of the facility (from Section B) in the surrounding waters, where these species may occur, are below the thresholds discussed in Section C. **EPA has made a determination that the effects of permitted emissions are discountable and are determined to be NLAA for these species**.

The table below includes EPA's determination with respect to each species in the action area. Note that these determinations also constitute EPA's determination on the critical habitat of the species in Table D with critical habitat designations.

Species	Determination	Explanation
Blue Whale	Discountable/NLAA	Extremely unlikely to be exposed because this species occurs infrequently in the Caribbean
Fin Whale Sei Whale	Discountable/NLAA	Extremely unlikely to be exposed because these species are not common in Caribbean waters and, when present, occur in deeper waters than those within the emissions impact area.
Sperm Whale	Discountable/NLAA	Extremely unlikely to be exposed because this species occurs in deeper waters than those within the emissions impact area.
Green Turtle North Atlantic DPS South Atlantic DPS	Discountable/NLAA	Deposition impacts from air emissions unlikely to have a negative impact on the species. Species expected to transit past impacted areas, so any exposures would be short-term.
Hawksbill Turtle	Discountable/NLAA	Deposition impacts from air emissions unlikely to have a negative impact on the species. Species expected to transit past impacted areas, so any exposures would be short-term.

Species	Determination	Explanation
Leatherback Turtle	Discountable/NLAA	Deposition impacts from air emissions unlikely to have a negative impact on the species. Species expected to transit past impacted areas, so any exposures would be short-term.
Loggerhead Turtle Northwest Atlantic Ocean DPS	Discountable/NLAA	Deposition impacts from air emissions unlikely to have a negative impact on the species. Species expected to transit past impacted areas, so any exposures would be short-term.
Giant Manta Ray	Discountable/NLAA	Extremely unlikely to be exposed because this species occurs in deeper waters than those within the emissions impact area. No known cleaning stations in the area.
Nassau Grouper	Discountable/NLAA	Deposition impacts from air emissions unlikely to have a negative impact on the species. Species expected to transit past impacted areas, so any exposures would be short-term.
Oceanic Whitetip Shark	Discountable/NLAA	Extremely unlikely to be exposed because this species occurs in deeper waters than those within the emissions impact area.
Scalloped Hammerhead Shark Central and Southwest Atlantic DPS	Insignificant/NLAA	Nursery habitat for the species doesn't occur in affected area. Species expected to transit past impacted areas, so any exposures would be short-term.
Boulder Star Coral	Discountable/NLAA	Deposition impacts from air emissions unlikely to have a negative impact on the species.
Elkhorn Coral	Discountable/NLAA	Deposition impacts from air emissions unlikely to have a negative impact on the species.
Lobed Star Coral	Discountable/NLAA	Deposition impacts from air emissions unlikely to have a negative impact on the species.
Mountainous Star Coral	Discountable/NLAA	Deposition impacts from air emissions unlikely to have a negative impact on the species.
Pillar Coral	Discountable/NLAA	Deposition impacts from air emissions unlikely to have a negative impact on the species.
Rough Cactus Coral	Discountable/NLAA	Deposition impacts from air emissions unlikely to have a negative impact on the species.
Staghorn Coral	Discountable/NLAA	Deposition impacts from air emissions unlikely to have a negative impact on the species

References:

Characterizing Emissions, Air Quality, Deposition and Water Quality. [online] Available at: https://yosemite.epa.gov/sab/sabproduct.nsf/264cb1227d55e02c85257402007446a4/CC55D2AF9867965C85257781005A9CC4/$File/Characterizing+Emissions,+Air+Quality,+Deposition+and+Water+Quality.pdf

Gantt, B., Kelly, J., Bash, J., 2015. Updating sea spray aerosol emissions in the Community Multiscale Air Quality (CMAQ) model version 5.0. 2. Geoscientific Model Development 8, 3733-3746.

Garcia Moliner, Graciela & Sadovy, Yvonne. (2008). The Case for Regional Management of the Nassau grouper, Epinephelus striatus. 60.

Guenther, A., Karl, T., Harley, P., Wiedinmyer, C., Palmer, P., Geron, C., 2006. Estimates of global terrestrial isoprene emissions using MEGAN (Model of Emissions of Gases and Aerosols from Nature).

Kadison, E.. (2009). Nassau Grouper (Epinephelus striatus) in St. Thomas, US Virgin Islands, with Evidence for a Spawning Aggregation Site Recovery. Proceedings of the Sixty second Gulf and Caribbean Fisheries Society. 62. 273-279.

CLAD Database Access. [online] Available at: <http://nadp.slh.wisc.edu/committees/clad/db/>.

Nilsson, J., Grennfelt, P., Ministerråd, N., 1988. Critical Loads for Sulphur and Nitrogen: Report from a Workshop Held at Skokloster, Sweden, 19–24 March, 1988. Nordic Council of Ministers.

NOAA National Centers for Coastal Ocean Science, 2014. Marine Protected Areas of the U.S. Virgin Islands Ecological Performance Report.

NOAA National Marine Fisheries Service, 2019. Biological Opinion on the 2018 Virgin Islands Water Quality Standards.

NOAA National Marine Fisheries Service, 2019. Limetree Bay Terminal Single Point Mooring, St. Croix, USVI, (SAJ-2017-00416 (SP-JCM)) Biological Opinion.

Otte, T., Pleim, J., 2010. The Meteorology-Chemistry Interface Processor (MCIP) for the CMAQ modeling system: updates through MCIPv3. 4.1. Geoscientific Model Development 3, 243-256.

Sarwar, G., Gantt, B., Schwede, D., Foley, K., Mathur, R., Saiz-Lopez, A., 2015. Impact of enhanced ozone deposition and halogen chemistry on tropospheric ozone over the Northern Hemisphere. Environmental science & technology 49, 9203-9211.

U.S. Environmental Protection Agency, 2009. Risk and Exposure Assessment for Review of the Secondary National Ambient Air Quality Standards for Oxides of Nitrogen and Oxides of Sulfur.

U.S. Environmental Protection Agency, 2015. Biological evaluation for the National Marine Fisheries Service in regards to the U.S. Virgin Islands water quality standards.

U.S. Environmental Protection Agency, 2017. EPA's Guideline on Air Quality Models at 40 CFR Part 51, Appendix W.

U.S. Environmental Protection Agency, 2020a. 2017 National Emissions Inventory (NEI) Technical Support Document. https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-technicalsupport-document-tsd.

U.S. Environmental Protection Agency, 2020b. Technical Support Document for EPA's Updated 2028 Regional Haze Modeling for Hawaii, Virgin Islands, and Alaska.

U.S. Forest Service, National Park Service, and U.S. Fish and Wildlife Service. 2010. Federal land managers' air quality related values work group (FLAG): phase I report—revised (2010). Natural Resource Report NPS/NRPC/NRR—2010/232. National Park Service, Denver, Colorado.

U.S. Forest Service, National Park Service, and U.S. Fish and Wildlife Service. 2011. Federal land managers' interagency guidance for nitrogen and sulfur deposition analyses: November 2011. Natural Resource Report NPS/NRSS/ARD/NRR—2011/465. National Park Service, Denver, Colorado.

Wiedinmyer, C., Akagi, S., Yokelson, R.J., Emmons, L., Al-Saadi, J., Orlando, J., Soja, A., 2011. The Fire Inventory from NCAR (FINN): A high resolution global model to estimate the emissions from open burning. Geoscientific Model Development 4, 625.